

Thousand Hills Woodland Conservation Strategies

- Manage 3,600 acres of public land for forest, woodland and savanna natural communities.
- Restore woodland and savanna natural communities on private lands.
- Initiate a public outreach effort to inform landowners and the public about woodland restoration; discourage conversion of wooded land to other uses.
- Acquire key parcels adjoining existing public lands.
- Control invasive exotic plants, including autumn olive and sericea lespedeza.
- Promote the management of prairie remnants.



Thinning forests is one method to help restore overgrown woodland landscapes. Opening the canopy allows sunlight to reach the ground, necessary for many woodland grasses and wildflowers.

Missouri Department of Conservation

Priority Research and Inventory Needs

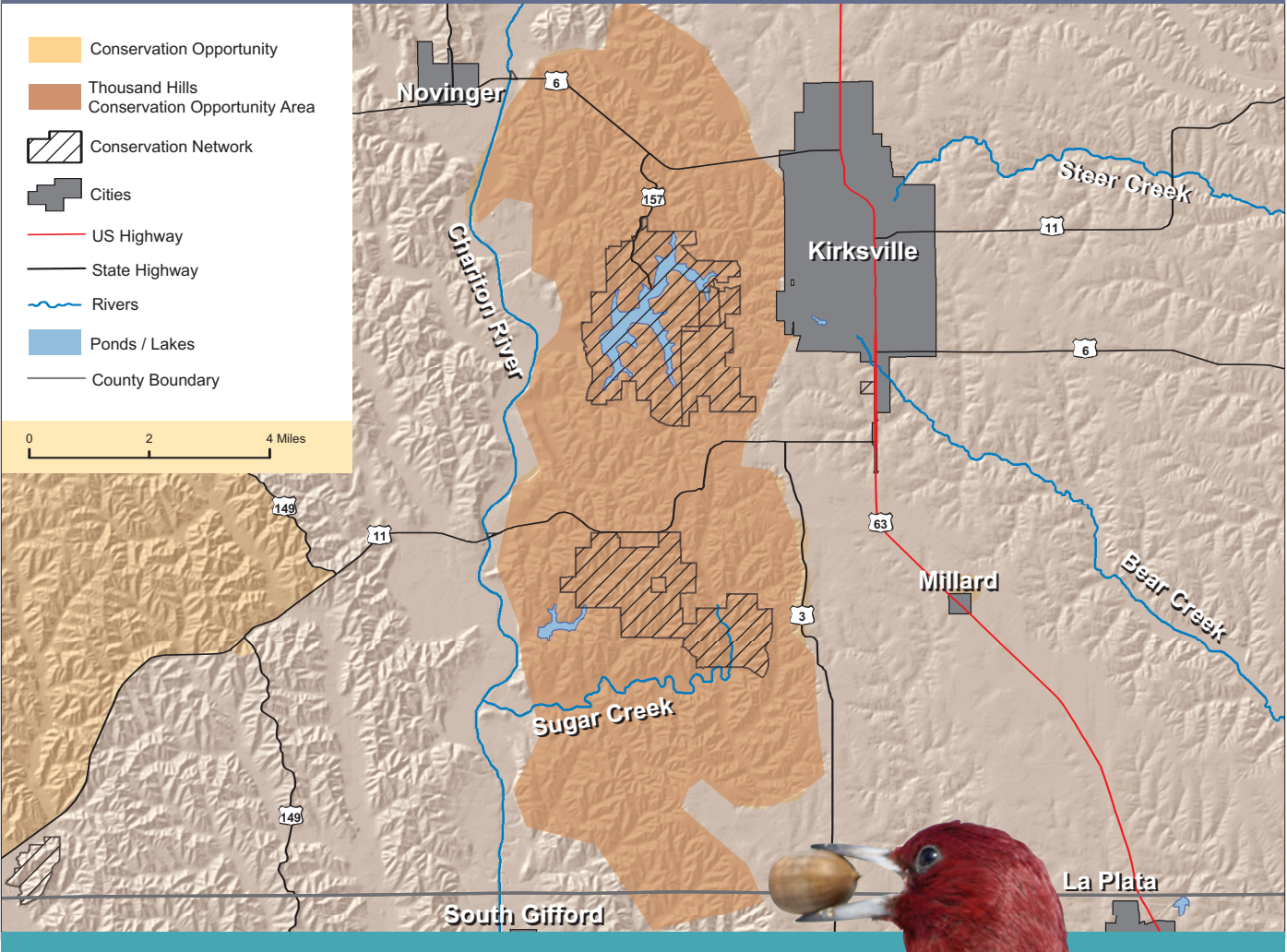
- Identify and prioritize specific tracts with high potential for woodland and savanna restoration.
- Assess the threat of exotic plant species to the proposed restorations; develop management strategies if appropriate.
- Conduct a literature review to determine the effect of fire on the commercial value of trees.
- Survey for Indiana bats.
- Survey landowners to determine objectives for their property; work with them to identify appropriate management strategies and compatible economic opportunities.

Conservation Partners

Existing: Truman State University; private landowners; Missouri Department of Natural Resources (DNR); Missouri Department of Conservation (MDC)

Potential: National Wild Turkey Federation (NWTf); Missouri Prairie Foundation; The Nature Conservancy – Missouri Chapter; Audubon Missouri; Missouri Bird Conservation Initiative (MoBCI); Midwest Invasive Plant Network; Missouri Conservation Heritage Foundation (MCHF); private landowners; U.S. Fish and Wildlife Service (USFWS); Natural Resources Conservation Service (NRCS)

Thousand Hills Woodland Conservation Opportunity Area



Funding Sources

Existing: DNR annual budget; MDC annual budget; MDC State Wildlife Grants; MDC Wildlife Diversity Funds

Promising Future Sources: USFWS Partners for Fish and Wildlife Program; NWTf Wild Turkey Super Fund; MoBCI Grants; NRCS Wildlife Habitat Incentive Program; MDC Landowner Incentive Program; National Fish and Wildlife Federation Grants; MCHF Grants

Existing Conservation Network

Thousand Hills State Park; Big Creek Conservation Area; Sugar Creek Conservation Area

The red-headed woodpecker is the characteristic woodpecker of woodlands. Woodpeckers create nesting cavities in woodland trees. These cavities are later used by other birds and animals.

Jim Rathert, Missouri Department of Conservation



Prescribed Fire – a Tool for Healthy Woodlands



Woodlands need periodic fires to maintain their openness. Prescribed burns recreate fires that once swept through from nearby prairies.

Missouri Department of Conservation

Conservation Challenges

The Thousand Hills Woodland Conservation Opportunity Area contains one of the largest blocks of woodland in northern Missouri. Unfortunately, many of the landscape's savannas and woodlands have succeeded to a closed canopy

in the absence of fire. Potential challenges to conservation success include the difficulty of applying prescribed fire (especially on private lands), an increasing number of small residential properties and a lack of staff time and funding.

To learn more about the Thousand Hills Woodland Conservation Opportunity Area, please contact:



Missouri Department of Conservation
Wildlife Division
P.O. Box 180
Jefferson City, MO 65102-0180

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Thousand Hills Woodland

Conservation Opportunity Area



Central Dissected
Till Plains



Many of Missouri's "forests" are actually woodlands that have overgrown and shaded out the complex understory of woodland grasses and wildflowers.

Missouri Department of Conservation

Looking over this northern Missouri landscape, it's easy to imagine why residents refer to the area as "thousand hills." Gently rolling hills and steep, rugged inclines can be found in this patchwork of forests, woodlands and grassy meadows.

The formation of this landscape began when glaciers retreated and left the land covered with a thick layer of soil. Ridges and valleys formed as rivers and streams cut down into the earth, dissecting the land and forming "thousands of hills."

The Thousand Hills Woodland Conservation Opportunity Area (COA) contains one of the largest tracts of timbered habitat in northern Missouri. Significant tracts have good woodland restoration potential and still support remnant populations of woodland plants. Additionally, this

wooded landscape represents a significant resource for woodland birds, including great-crowned flycatchers, red-headed woodpeckers, eastern wood pewees and summer tanagers.

Historically, the Thousand Hills Woodland COA consisted of a complex mosaic of narrow ridgetop prairies and savannas grading into oak woodlands on upper slopes, with forests on protected slopes and bottoms. Presently, the landscape is more than 60 percent forested. Most of these forests are closed-canopied, second-growth forests, but significant acreages on upper slopes and ridgetops still retain woodland features. Much of the remaining landscape has been cleared for pastures dominated by non-native grasses, especially tall fescue.

Union Ridge Conservation Strategies

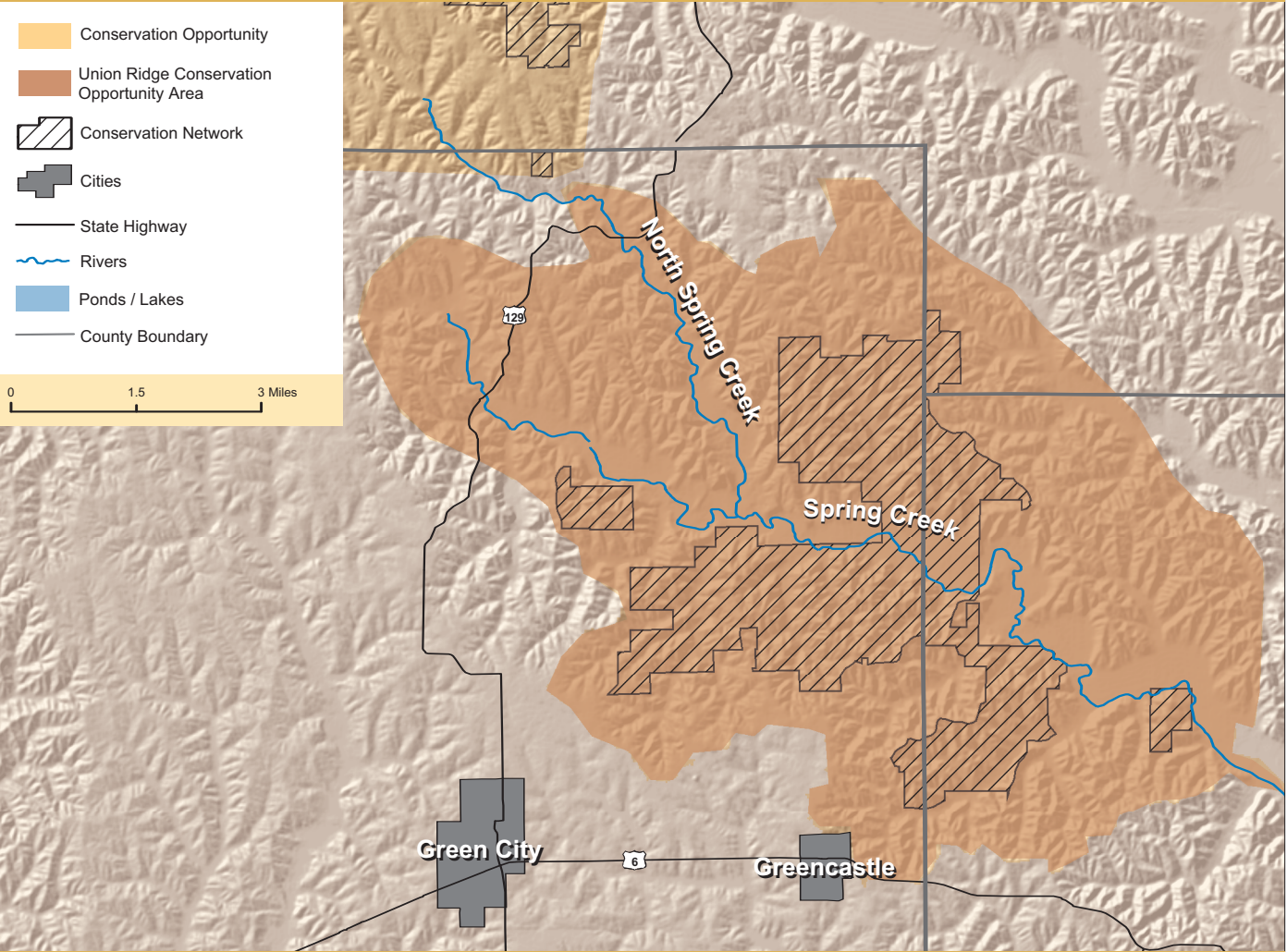
- Increase public understanding about savannas; educate the public about savanna community management and the fish and wildlife that live in savanna landscapes.
- Expand savanna and woodland community management on public and private lands.
- Conserve savanna and woodland plants and animals.
- Conserve aquatic life.
- Protect and manage riparian corridors.



Prescribed fires rejuvenate desirable plants, control herbaceous weeds and woody plants and improve the value of vegetation to livestock and wildlife.

Elsa Gallagher, Missouri Department of Conservation

Union Ridge Conservation Opportunity Area



- ### Priority Research and Inventory Needs
- **Inventory streams; evaluate potential habitat for Topeka shiner reintroduction.**
 - **Conduct a stream community inventory (including the existing brassy minnow population).**
 - **Assess location and abundance of problem exotic plants.**
 - **Conduct plant and animal inventories (wildflowers, wildlife communities, tree composition).**
 - **Inventory and prioritize savanna restoration areas.**
 - **Research savanna reconstruction methods.**
 - **Develop and conduct a landowner survey.**
 - **Inventory condition of riparian corridor.**

- ### Conservation Partners
- Existing:** Missouri Department of Conservation (MDC)
- Potential:** Quail Unlimited (QU); National Wild Turkey Federation (NWTF); Missouri Prairie Foundation; Pheasants Forever; Missouri Conservation Heritage Foundation (MCHF); private landowners; University of Missouri Extension; Natural Resources Conservation Service (NRCS); U.S. Fish & Wildlife Service (USFWS)

- ### Funding Sources
- Existing:** MDC annual budget; MDC Private Lands Cost Share Program; Farm Service Agency Conservation Reserve Program
- Promising Future Sources:** NWTF Wild Turkey Super Fund; QU Quail Habitat Incentive Funds; USFWS Partners for Fish and Wildlife Program; NRCS Environmental Quality Incentives Program; NRCS Wildlife Habitat Incentive Program; NRCS Grassland Reserve Program; NRCS Conservation Security Program; Missouri Bird Conservation Initiative grants; MDC State Wildlife Grants; MDC Wildlife Diversity Funds; MDC Technical Service Provider Reimbursed Funds; MCHF Stream Stewardship Trust Fund; MCHF Grants; National Fish and Wildlife Foundation Grants

- ### Existing Conservation Network
- Union Ridge Conservation Area; Shoemaker Conservation Area; Dark Hollow Natural Area



Bobwhite quail thrive in landscapes with a mixture of prairie, savanna and woodland habitats.

Jim Rathert,
Missouri
Department of
Conservation

Prescribed Fire in a Savanna Landscape



A 1,500-acre portion of the Union Ridge Conservation Area is currently managed to restore prairie and savanna communities. Through the use of prescribed burning, the restoration is converting a former fescue pasture to a diverse mix of native grasses and wildflowers. Characteristic species such as big bluestem, little bluestem, pale purple coneflower, prairie clover and leadplant are now flourishing, increasing the aesthetic appeal and wildlife value of these habitats.

Missouri Department of Conservation

Conservation Challenges

The Union Ridge Conservation Opportunity Area is a mosaic of grasslands, cropland, old fields, prairies, savannas and woodlands. Savannas and woodlands once so widespread are just beginning to undergo limited restoration. Potential challenges to conservation success include limited

landowner understanding of savanna ecosystems, a lack of trained contractors for prescribed burns, conflicting recreational uses on public lands, difficulty of using prescribed burns on private land and limited funding and staff time.

To learn more about the Union Ridge Conservation Opportunity Area, please contact:



Missouri Department of Conservation
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P.O. Box 180
Jefferson City, MO 65102-0180

Union Ridge Conservation Opportunity Area



Central Dissected
Till Plains



Union Ridge Conservation Area provides one of the best examples of savanna restoration in northern Missouri.

Mike Jones, Missouri Department of Conservation

Over 6 million acres of savanna occurred in Missouri prior to the 1800s. Today, these grasslands with scattered trees and shrubs have nearly vanished. Savanna and associated prairie and woodland natural communities were historically maintained by natural or human-caused fires and grazing by bison and elk.

The Union Ridge Conservation Opportunity Area (COA) provides one of the best opportunities for savanna, woodland and prairie management in northern Missouri. Native prairie and savanna once occupied many of the landscape's ridges and upper slopes; woodlands occurred on side slopes and draws.

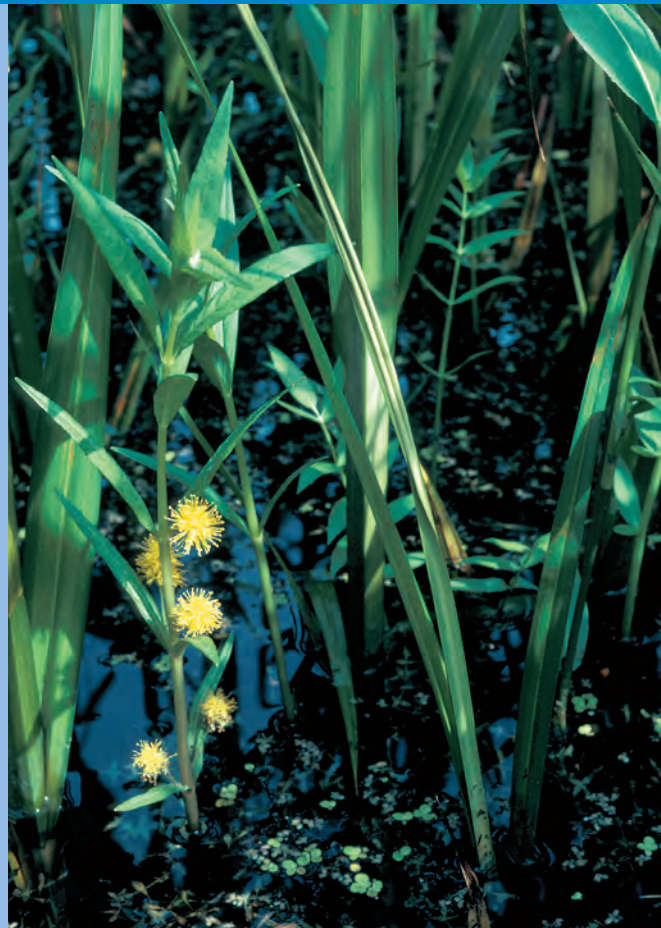
Common species such as northern bobwhite, red-

headed woodpeckers, field sparrows and brown thrashers occur in these savanna and woodland communities. There is great potential to improve populations of northern bobwhite as a result of natural community management in the Union Ridge COA.

Spring Creek is a characteristic prairie stream that runs through Union Ridge COA. Brassy minnows, a Missouri species of conservation concern, occur in Spring Creek and North Spring Creek. Several tributaries of Spring Creek serve as potential reintroduction sites for Topeka shiners, a federally endangered fish. Topeka shiners and brassy minnows live in small, moderately clear prairie creeks with permanent pools and sandy or gravelly bottoms.

Wakenda Bottoms Conservation Strategies:

- Restore prairie, wetland and woodland natural communities.
- Restore wetland habitats on private land.
- Restore connectivity of the Missouri River with wetlands, restoring shallow water habitat where possible.
- Increase understanding, appreciation, respect and recreational use of the Missouri River.
- Control populations of problematic invasive and exotic plants and animals.
- Conserve existing Natural Areas; identify additional remnant natural communities.
- Improve water quality by utilizing small wetlands and other conservation measures to reduce loss of floodplain farm nutrients into river systems.
- Develop outreach strategies to help landowners understand the value and importance of wetland systems to their economic and social well-being.



Ken McCarty, Missouri Department of Natural Resources

Visitors can view **tufted loosestrife** in this restored marsh at Oumessourit Natural Area, Van Meter State Park.

Priority Research and Inventory Needs

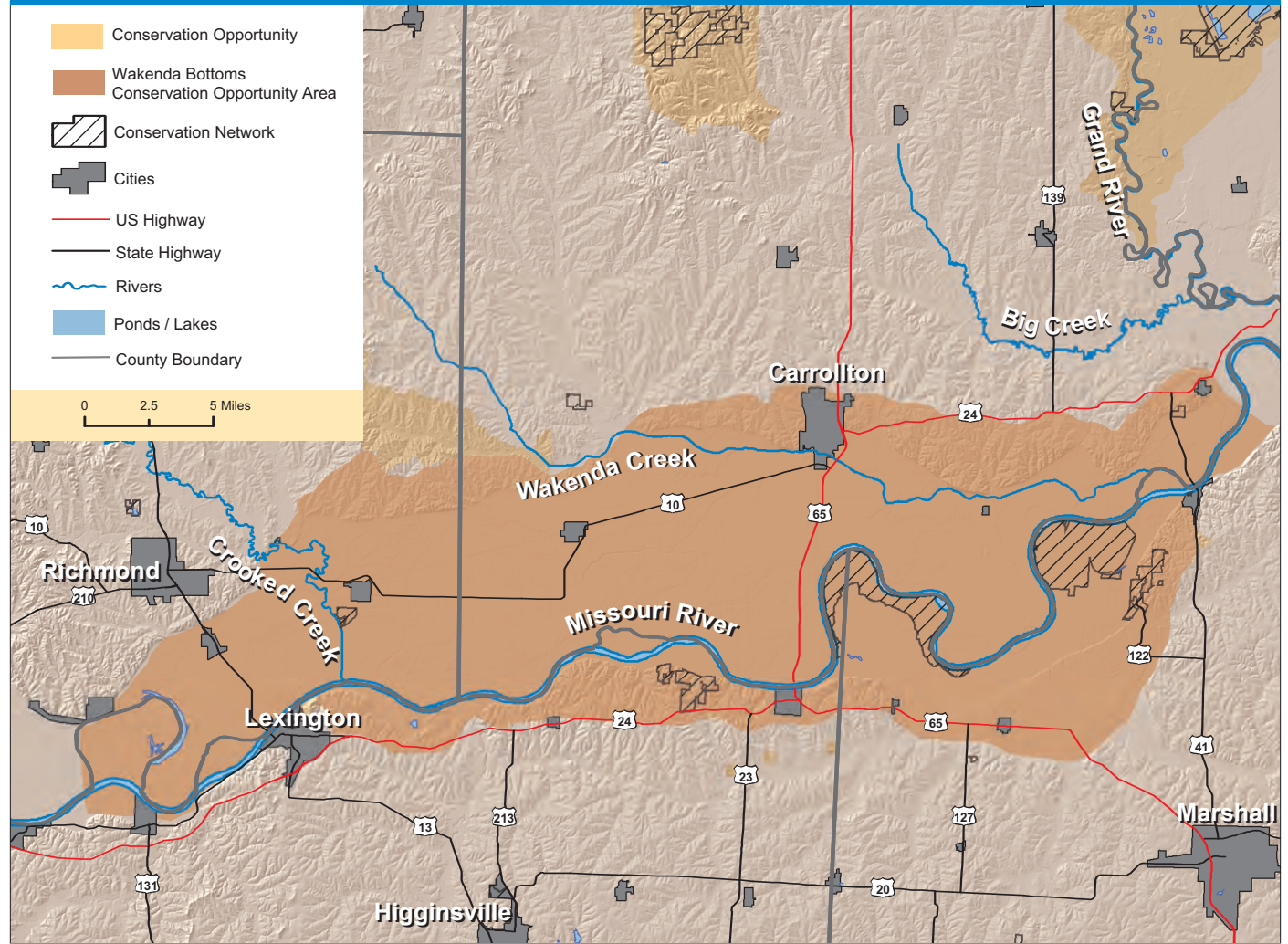
- Inventory remnant native plants and natural communities.
- Determine the economic and environmental impact of wetland conservation practices.
- Establish improved methods for controlling exotic and invasive plants and animals.
- Improve techniques for restoring diverse wet prairies.
- Improve techniques for restoring bottomland woodlands.
- Correlate existing habitats and natural communities with breeding bird inventories and nesting success.

Conservation Partners

Existing: Ducks Unlimited (DU); National Wild Turkey Federation (NWTF); University of Missouri Cooperative Fish and Wildlife Research Unit; Natural Resource Conservation Service (NRCS); Missouri Department of Natural Resources (DNR); Missouri Department of Conservation (MDC); U.S. Fish and Wildlife Service (USFWS)

Potential: Friends of Big Muddy; Audubon Missouri; Missouri Waterfowl Association; American Rivers; University of Missouri Extension; Missouri Conservation Heritage Foundation (MCHF)

Wakenda Bottoms Conservation Opportunity Area



Funding Sources

Existing: USFWS annual budget; USFWS Partners for Fish and Wildlife Program; DNR annual budget; MDC annual budget; MDC Private Lands Cost Share Program; Farm Service Agency Conservation Reserve Program; NRCS Wetland Reserve Program; Soil and Water Conservation Districts State Cost Share Funds; DU Matching Aid Restoring State Habitat; DU/MDC Conservation Reserve Enhancement Program CP-23 Wetland Restoration; U.S. Army Corps of Engineers Missouri River Recovery and Mitigation Funds; NWTF Wild Turkey Super Fund; Missouri Waterfowl Association annual budget

Promising Future Sources: MDC State Wildlife Grants; MDC Wildlife Diversity Funds; MCHF Stream Stewardship Trust Fund; MCHF Grants; Missouri Bird Conservation Initiative Grants; DNR 319 Grant; Missouri Corn Growers Association Environmental Resource Coalition Research Funds

Northern pintails commonly migrate through Missouri. Many kinds of waterfowl rely on Missouri's wetlands.

Existing Conservation Network

Big Muddy National Fish and Wildlife Refuge (Cranberry Bend Unit); Van Meter State Park (Oumessourit Natural Area); Battle of Lexington State Historic Site; Grand Pass Conservation Area; Baltimore Bend Conservation Area; Harden Conservation Area; McKinny Conservation Area; Morton Bridge Access; Miami Access



Jim Rathert, Missouri Department of Conservation

Wetland Restoration



Ducks Unlimited, Inc. works to conserve, restore and manage wetlands. Partnering with the Missouri Department of Conservation, Ducks Unlimited provided funds to create a pumping station capable of delivering Missouri River water to wetland units at Grand Pass Conservation Area.

Jim Rathert, Missouri Department of Conservation

Conservation Challenges

Today, this once highly productive and diverse wildlife landscape has been converted into one of Missouri's most productive agricultural landscapes. It is in this highly altered setting that conservation partners must strive to find win-win opportunities with production agriculture for advancing soil, water and wildlife conservation. With collective and collaborative efforts to strengthen and advance large-scale restoration initiatives, private land programs and frugal acquisition and management of

public conservation lands, the Wakenda Bottoms COA provides excellent opportunity to restore and advance wildlife diversity. Potential challenges include limited landowner awareness, understanding and participation, inconsistent funding, highly altered geography and threats from invasive and exotic plants and animals (e.g., Asian carp, zebra mussel, purple loosestrife, Johnson grass, reed canary grass, garlic mustard, sesbania).

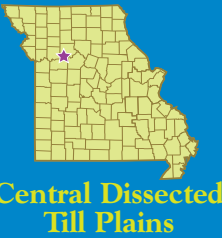
To learn more about the Wakenda Bottoms Conservation Opportunity Area, please contact:



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Wakenda Bottoms

Conservation Opportunity Area



Central Dissected
Till Plains



Prescribed burns and water control structures at Oumessourit Natural Area (Van Meter State Park) have helped bring this marsh back to life.

Ken McCarty, Missouri Department of Natural Resources

In 1874, Campbell's Gazetteer of Missouri recorded the following notes about Wakenda Creek. "The Wakenda abounded with fine fish, and on its banks and in the adjacent timber were found deer, elk, buffalo, turkeys and other game in abundance. The Indians, thinking that a stream where the Great Spirit had placed such quantities of game and fish, must be sacred, dared not destroy or kill anything in the neighborhood, except on festival days, and their festivities were always held on the banks of this river, bearing its name 'Wakenda,' meaning God's river."

The Wakenda Bottoms Conservation Opportunity Area (COA) occupies a broad reach of the Missouri River floodplain. Wakenda Creek flows 25 miles along the northern boundary of the floodplain before joining the Missouri River at Miami. This exceptionally wide floodplain lies between rugged hills bordering the

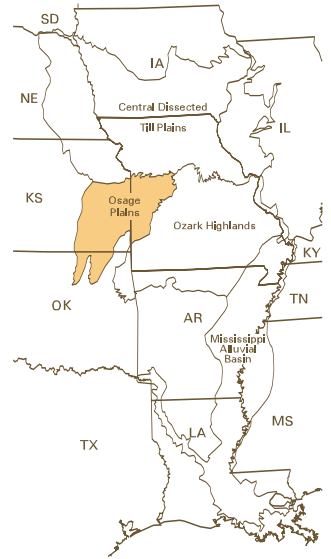
Missouri River Valley. Several large remnant wetlands and several "blue holes" created by the Great Flood of 1993, provide evidence of the dynamic power, ecological importance and wandering nature of the Missouri River. Wakenda Bottoms includes a large terrace that drains away from the Missouri River containing fens and seeps. Oumessourit Natural Area, located at Van Meter State Park, preserves remnants of marshes, fens and woodlands.

Historically, the dynamic shifting of the Missouri River with its braided channels and fluctuating water levels created a mosaic of marshes and wet prairies. Poorly drained soils on the northern side of the river formerly supported one of the most extensive bottomland prairies on the Missouri River. The surrounding rugged hills were dominated by woodlands.

Osage Plains

The Osage Plains are greatly influenced by the Great Plains to the west. Once over 80 percent tallgrass prairie, vast herds of bison and raging wildfires shaped the region's plant communities and wildlife. These grasslands were never affected by glaciers, resulting in shallower soils that are much less fertile than those of north Missouri. Savannas occurred along "breaks" in the landscape. Thin bands of forest were restricted to valleys, particularly along major water courses where rich bottomlands formed extensive wetlands.

While most of the Osage Plains is now converted to pastures of non-native grasses or cropland, there are significant opportunities to restore functioning grasslands that will conserve prairie plants and animals.



Photos: Prairie Landscape: Jim Rathert,
Missouri Department of Conservation
Greater Prairie-chicken: ©
Noppadol Paothong

Osage Plains

Animal Targets of the Osage Plains

Forest

Yellow-billed Cuckoo • Cerulean Warbler •
Prothonotary Warbler

Woodland

Chuck-will's-widow • Red-headed Woodpecker
• Eastern Wood-pewee • Baltimore Oriole • Orchard
Oriole

Savanna

Northern Bobwhite • Brown Thrasher • Field Sparrow •
Harris's Sparrow

Prairie

Grassland Crayfish • An Andrenid Bee (*Andrena*
beameri) • Prairie Mole Cricket • Regal Fritillary • Great
Plains Narrow-mouthed Toad • Northern Crawfish Frog
• Southern Prairie Skink • Western Slender Glass Lizard
• Bullsnake • Upland Sandpiper • Swainson's Hawk •
Northern Harrier • Greater Prairie Chicken • Short-
eared Owl • Scissor-tailed Flycatcher • Sprague's Pipit •
Loggerhead Shrike • Bell's Vireo • Dickcissel •
Henslow's Sparrow • Grasshopper Sparrow • Lark
Sparrow • Smith's Longspur • Eastern Meadowlark •
Black-tailed Jackrabbit

Wetland

Rusty Blackbird

River and Stream

Blacknose Shiner • Freckled Madtom • Ghost Shiner •
Logperch • Redfin Darter



Regal Fritillary



Scissor-tailed Flycatcher



Bullsnake

Cole Camp/Hi Lonesome Conservation Strategies:

- Increase nesting and brood rearing cover for greater prairie-chickens and other grassland birds.
- Restore riparian corridors to help maintain and enhance blacknose shiner populations.
- Increase public awareness and understanding of prairies, implement best management practices and promote outdoor recreation and ecotourism.
- Focus conservation, restoration and management efforts on the existing conservation network and with additional willing private landowners.
- Expand efforts to decrease exotic invasive plants like sericea lespedeza.



Jim Rathert, Missouri Department of Conservation

Coreopsis dots the landscape at Paint Brush Prairie Conservation Area. The Missouri Department of Conservation manages this prairie with alternate treatments of haying, resting and burning.

Priority Research and Inventory Needs

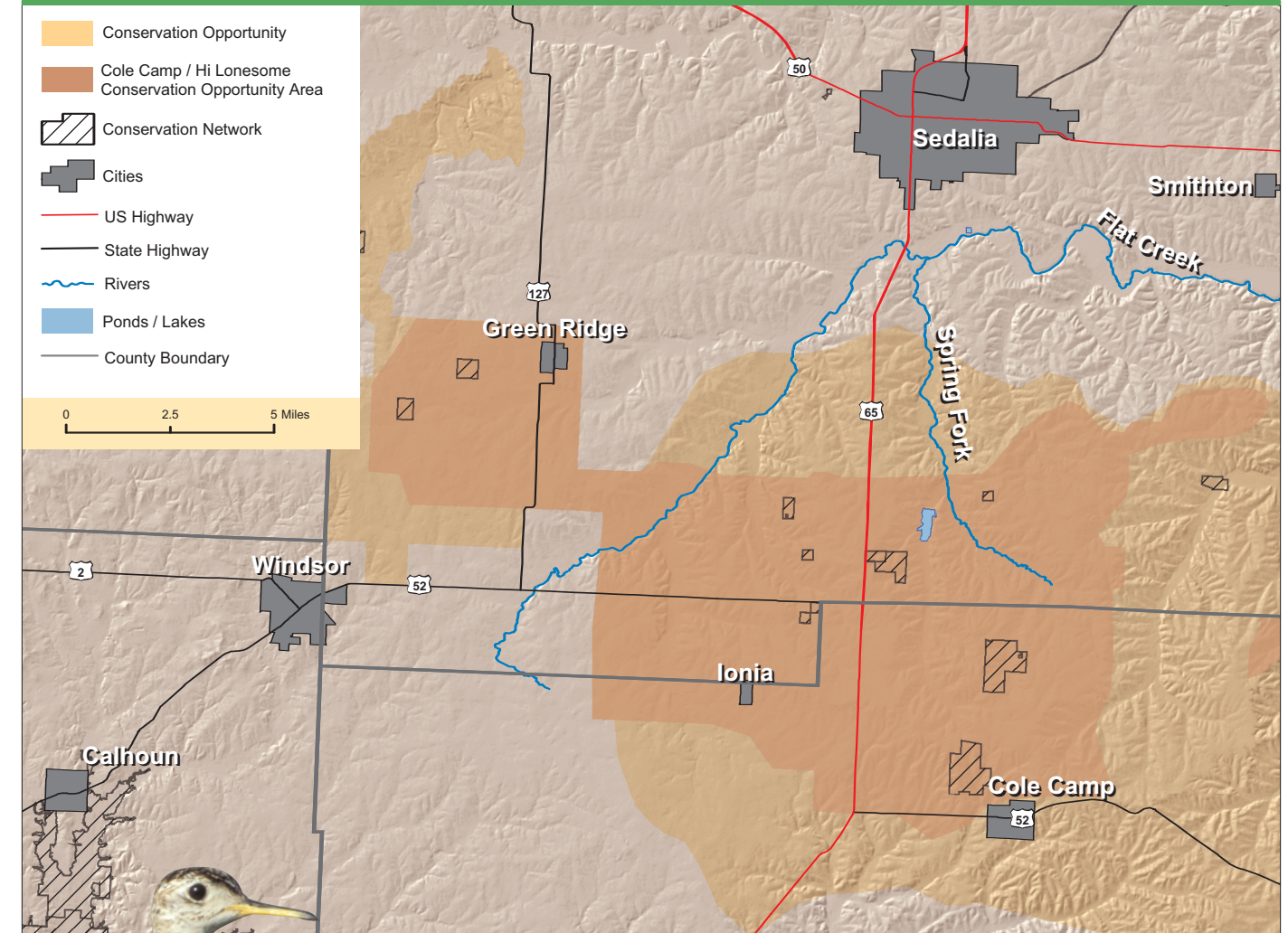
- Research the grassland insect community.
- Conduct landowner focus groups to determine interest, practicality and ability of landowners regarding the adoption of alternative land management practices such as prairie reconstruction, warm season grass conversions for grazing systems, prescribed burning and patch-burn/grazing.
- Conduct additional fish and mussel inventories in South Flat Creek and Spring Fork Creek to determine community composition and blacknose shiner populations.
- Use the Missouri Natural Heritage Database to track status of natural communities and species of concern; consolidate and update natural community inventories.

Conservation Partners

Existing: Missouri Prairie Foundation (MPF); Grasslands Coalition; The Nature Conservancy – Missouri Chapter (TNC); Cole Camp Betterment Association; U.S. Fish and Wildlife Service (USFWS); Missouri Department of Conservation (MDC)

Potential: Audubon Missouri; National Wild Turkey Federation (NWTf); Quail Unlimited (QU); University of Missouri Food Circles Project; Missouri Stream Teams; Missouri Conservation Heritage Foundation (MCHF); Natural Resources Conservation Service (NRCS)

Cole Camp/Hi Lonesome Conservation Opportunity Area



Some prairie birds have adapted well to less pristine environments; others have not. Upland sandpipers are declining in population. During courtship, upland sandpipers make a shrill wolf whistle while wheeling through the air on stiff wings.

Jim Rathert, Missouri Department of Conservation

Funding Sources

Existing: TNC annual budget; MPF annual budget; MDC annual budget; MDC State Wildlife Grants; MDC Private Lands Cost Share Program; NRCS Grassland Reserve Program; NRCS Wildlife Habitat Incentive Program; NRCS Environmental Quality Incentives Program; Farm Service Agency Conservation Reserve Program; USFWS Partners for Fish and Wildlife Program

Promising Future Sources: MDC State Wildlife Grants; MDC Wildlife Diversity Funds; MDC Landowner Incentive Program; QU Quail Habitat Incentive Funds; MCHF Stream Stewardship Trust Funds; MCHF grants; Missouri Bird Conservation Initiative Grants; National Fish and Wildlife Foundation grants; Missouri Department of Natural Resources Recreational Trails Program; NWTf Wild Turkey Super Fund

Existing Conservation Network

Hi Lonesome Prairie Conservation Area; Mora Conservation Area; Grandfather Prairie Conservation Area; Paint Brush Prairie Conservation Area and Natural Area; W.R. Kearn Memorial Conservation Area; J.N. Kearn Memorial Wildlife Area; Bruns Tract; Goodnight-Henry Prairie; Friendly Prairie; Drover's Prairie

Surveying for Mead's Milkweed



Mead's milkweed surveys on Paint Brush Prairie Conservation Area involve survey crews spaced one meter apart along a 50-foot rope. As they walk along, the crew marks each plant they find. Periodic surveys, like this annual Mead's milkweed survey, are useful to monitor the health of plants, animals and natural communities.

Missouri Department of Conservation

Conservation Challenges

Once nearly all tallgrass prairie, the Cole Camp/Hi Lonesome COA today is a mixture of fescue pasture, small prairie remnants and cropland. Much of the existing forested areas are comprised of invasive tree species encroaching in areas that were historically prairie. Trees and shrubs have also encroached along fencerows and stream corridors, further fragmenting the grassland vista and serving as predator habitat. Additional threats to this landscape include continued habitat conversion to

cool season pasture and cropping systems, expanding urban development south of Sedalia, the spread of invasive and exotic species (such as sericea lespedeza) and siltation and agricultural runoff into streams. Potential challenges to conservation success include gaining private landowner acceptance and participation, improving agency and landowner relationships, understanding overlapping initiatives, lack of program continuity and a lack of funding and staff time.

To learn more about the Cole Camp/Hi Lonesome Conservation Opportunity Area, please contact:



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Cole Camp/ Hi Lonesome

Conservation Opportunity Area



Native tallgrass prairie once stretched continuously for miles in the Cole Camp/Hi Lonesome Conservation Opportunity Area. Today, significant patches remain, making this landscape a good candidate for restoration.

Jim Rathert, Missouri Department of Conservation

The Cole Camp/Hi Lonesome Conservation Opportunity Area (COA) provides an excellent opportunity to conserve prairie wildlife and high quality streams at a landscape scale. Over 1,500 acres of remnant prairie are currently owned and protected by The Nature Conservancy, Missouri Prairie Foundation and Missouri Department of Conservation. Privately owned remnant prairies adjoin the existing conservation network, and additional grasslands hold significant restoration potential. South Flat Creek and Spring Fork Creek are considered high priority streams for aquatic wildlife, including the blacknose shiner, a species of conservation concern.

Nineteen other species of conservation concern are recorded from the Cole Camp/Hi Lonesome COA, including federally and state listed species and numerous

prairie specialist plants and animals. Among these are Mead's milkweed, upland sandpiper, Henslow's sparrow and prairie mole crickets. The Cole Camp/Hi Lonesome COA is also one of the few remaining Missouri landscapes that support a population of greater prairie-chickens.

Success for the long-term preservation of tallgrass prairie landscapes and wildlife will require large-scale prairie protection and restoration by cooperating private and public land partners. Nonprofit organizations and state agencies are already working together on grassland management and preservation to maintain and increase the diversity of grassland plants and wildlife. Outreach efforts to private landowners will be needed to ensure conservation of remnant grasslands and to create suitable habitat for grassland and aquatic species within the landscape.